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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/683,149	11/27/2001	Marc Schaepkens	RD28667	5978

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EXAMINER	
HASSANZADEH, PARVIZ	
ART UNIT	**PAPER NUMBER**
1763	5

DATE MAILED: 12/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/683,149	SCHAEPKENS, MARC	
	Examiner	Art Unit	
	Parviz Hassanzadeh	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 September 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) *32-44* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *17 September 2002* is: a)☒ approved b)☐ disapproved by the Examine

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *approved drawing correction* .

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group 1 (apparatus) in Paper No. 4 is acknowledged. The traversal is on the ground(s) that search and examination of the apparatus and the method do not impose a serious burden upon the Examiner. This is not found persuasive because inventions of Group I (apparatus) and Group II (method) have acquired a separate status in the art as shown by their different classification and the search and examination of the apparatus claims and method claims are not considered to be coextensive. Thus restriction for examination purposes as indicated is proper and search and examination of both Groups I and II would impose a serious burden on the Examiner.

The requirement is still deemed proper and is therefore made FINAL.

Claims 32-44 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected method, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 4.

Drawings

The *proposed drawing correction* and/or the proposed substitute sheets of drawings, filed on 9/17/02 have been approved by the Examiner. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-16, 18-23 and 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang (US Patent No. 6,383,953 B2) in view of Knowles et al (US Patent No. 5,560,779).

Hwang teaches a plasma processing apparatus (Figs. 4, 5) comprising:

a plurality of plasma torches 200, wherein as shown in Fig. 2, when a high DC voltage is applied to an inner electrode 210 and to an outer electrode 212, a high temperature plasma frame 218 is generated from a plasma gas introduced via an inlet tube 202 in each plasma torch 200 (column 5, lines 44-65) (*at least one array of a plurality of plasma sources for generating a plurality of plasma, wherein each of the plurality of plasma sources includes a cathode, an anode, and an inlet for a non-reactive plasma source disposed in a plasma chamber*);

a processing (*deposition*) chamber 302 in which a substrate 306 is mounted and the chamber being in communication with the plasma torches 200 (column 5, lines 33-42) (*a deposition chamber for containing the substrate, wherein the deposition chamber is in fluid communication with the plasma chambers, and wherein the plasma chamber is maintained at a first predetermined pressure and the deposition chamber is maintained at a second predetermined pressure, the second predetermined pressure being less than the first predetermined pressure*); and

a disk type supply plate 312 having a plurality of nozzles 314 is installed in the chamber 302 for supplying a reactive gas, wherein the plurality of the plasma torches penetrating through the plate 312 (column 6, lines 28-34 and column 7, lines 6-10) (*at least one reactant gas injector disposed in the deposition chamber for providing a uniform flow rate of at least one reactant gas into each of the plurality of the plasmas*).

Hwang fails to teach the common reactant gas injector being disposed between anodes of each of the plurality of the plasma sources and the substrate.

Knowles et al teach a plasma processing apparatus comprising a deposition chamber 32, a plurality of plasma sources formed of anodes 82 and cathode 84, wherein a hydrocarbon feed gas may be introduced into the chamber via apertures 86 arranged on the plane containing the plasma source or via spray bars 102 arranged between the plasma source and a substrate 36. Knowles et al further each the injection of hydrocarbon feed gas may be upstream, downstream or within a mechanical containment structure arranged between the plasma source and the substrate in order to promote mixing of hydrocarbon feed gas with plasma stream (column 6, lines 19-67 and column 6, lines 43-51).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the spray bars 102 as taught by Knowles et al in the apparatus of Hwang in order to improve mixing of the hydrocarbon gas with the plasma stream.

Regarding claims 2-4, 25, 26: as shown in Figs. 4 and 5, the expanding thermal plasma sources are arranged in at least two dimensional array pattern.

Regarding claims 5-8, 27-30: the pressure of the gas in the plasma source and the deposition chamber are considered process limitations and the apparatus of Knowles et al in view

of Matsuda et al is capable of being operated under the conditions cited in the claims. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley,* 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.,* 15USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed dos not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham,* 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Regarding claims 9, 31: the plasma gas is an inert gas such as Ar (column 1, lines 47-54).

Regarding claims 10, 18: as shown in Fig. 5, the plate 312 having a first plurality of orifices 314 located at the central portion of the plate having a first flow rate, and having a second plurality of orifices 314 located at the peripheral portion of the plate having a second flow rate, wherein the first flow rate is substantially equal to the second flow rate.

Regarding claims 11-13, 19, 20: as shown in Fig. 5, the plate 312 having a first plurality of orifices 314 located at the central portion of the plate having a first predetermined number of orifices having a first linear density, and having a second plurality of orifices 314 located at the peripheral portion of the plate having a second predetermined number of orifices having a second linear density, wherein the first predetermined number is equal to the second predetermined number; and the first linear density is equal to the second linear density.

Regarding claims 14, 22: as shown in Fig. 5, the plate 312 having a first plurality of orifices 314 located at the central portion of the plate each having a first conductance, and having

a second plurality of orifices 314 located at the peripheral portion of the plate each having a second conductance, wherein the first conductance is equal to the second conductance.

Regarding claims 15-16, 21, 23: the distribution of the openings or orifices as well as the shape of the gas injector are considered obvious modification for distributing the gas preferentially over a section of the array of plasma in order to inject the reactant gas uniformly over the plasma gas. It was held in *re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)* that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

Claims 17 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang (US Patent No. 6,383,953 B2) in view of Knowles et al (US Patent No. 5,560,779) as applied to claims 1-16, 18-23 and 25-31 above, and further in view of Maeda et al (US Patent No. 5,620,523).

Hwang in view of Knowles et al teach all limitation of the claims as discussed above except for the reactant injector comprising an injector ring encompassing the array.

Maeda et al teach a plasma reactor including a ring-shaped reaction gas discharger 9a (Figs. 8A, 8B, 9A, 9B) arranged between a plasma forming chamber 1 and a wafer 20, wherein plasma flows through the center of the ring and the plasma does not react with the reactant gas on the surface of the ring and thus deposit is not formed on the ring which would peel off and fall on the wafer. (column 4, line 36 through column 5, line 17).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the ring-shaped reaction gas discharge design as taught by Maeda et al in

the apparatus of Hwang in order prevent forming deposit on the reactant gas injector which would peel off and fall on the substrate.

Claims 1-16, 18-23 and 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knowles et al (US Patent No. 5,560,779) in view of Matsuda et al (US Patent No. 6,189,485 B1).

Knowles et al teach an apparatus (Figs. 6-8) for depositing a uniform film coating on a planar surface of a substrate, the apparatus comprising:

a plasma generator 80 having a common anode 82 with a plurality of first apertures 84 and second apertures 86, and cathodes 88 disposed within the first apertures 84, wherein when a voltage is applied between the anode 82 and cathodes 88, an arc plasma is generated from a hydrogen source gas (*non-reactive plasma source gas*) flowing through the first apertures 84, wherein the second apertures 86 provides hydrocarbon feed gas, and wherein as shown in Fig. 6 the plasma sources are arranged in a two dimensional array (*at least one array of a plurality of plasma sources for generating a plurality of plasma, wherein each of the plasma sources includes a cathode, an anode, and an inlet for a non-reactive plasma source gas disposed in a plasma chamber*); and

a deposition chamber 32 in which the plasma generator 80 and a substrate 36 are disposed as shown in Fig. 1 (*a deposition chamber for containing the substrate, wherein the deposition chamber is in fluid communication with the plasma chambers, and wherein the plasma chamber is maintained at a first predetermined pressure and the deposition chamber is maintained at a second predetermined pressure, the second predetermined pressure being less than the first predetermined pressure*) (column 5, lines 19-41).

In another embodiment shown in Fig. 8, an injector grid 100 having a plurality of spray bars 102 which are preferably parallel and equally spaced is used for injecting reactant gas into the plasma (*at least one reactant gas injector disposed in the deposition chamber between the anodes of each of the plurality of the plasma sources and the substrate for providing a uniform flow rate of at least one reactant gas into each of the plurality of the plasmas*) (column 5, lines 42-57).

Knowles et al fail to explicitly teach the injection grid 100 being coupled to common gas source (*at least one common reactant gas injector disposed in the deposition chamber for providing a uniform flow rate of at least one reactant gas into each of the plurality of plasmas*).

Matsuda et al teach a Plasma CVD apparatus wherein a material (reactant) gas is injected into a deposition chamber through a tubular body forming tubular electrodes 51a-51f having a plurality of gas openings 58, wherein a material gas is entered through an entrance-side tubular electrode 51e (inlet manifold), distributed into the tubular electrodes 51a – 51d and exit through an exit-side tubular electrode 51f (outlet manifold) (Figs. 7, 8) (column 9, lines 11-49).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the gas distribution mechanism including the common gas inlet/outlet manifolds as taught by Matsuda et al in the apparatus of Knowles et al in order to distribute reactant gas uniformly over a substrate using a single reactant gas source.

Regarding claims 2-4, 25, 26: as shown in Figs. 6 and 7 of Knowles et al, the expanding thermal plasma sources are arranged in at least two dimensional array pattern.

Regarding claims 5-9, 27-31: the pressure of the gas in the plasma source and the deposition chamber as well as the type of the gas used are considered process limitations and the

apparatus of Knowles et al in view of Matsuda et al is capable of being operated under the conditions cited in the claims. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley,* 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.,* 15USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed dos not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham,* 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Regarding claims 10, 18: as shown in Fig. 8 of Matsuda et al, the tubular electrode 51a and 51d having a first plurality of orifices 58 having a first flow rate, and the tubular electrode 51b and 51c having a second plurality of orifices 58 having a second flow rate, wherein the first flow rate is substantially equal to the second flow rate.

Regarding claims 11-13, 19, 20: as shown in Fig. 8 of Matsuda et al, the tubular electrode 51a and 51d having a first plurality of orifices 58 having a first predetermined number of orifices having a first linear density, and the tubular electrode 51b and 51c having a second plurality of orifices 58 having a second predetermined number of orifices having a second linear density, wherein the first predetermined number is equal to the second predetermined number; and the first linear density is equal to the second linear density.

Regarding claims 14, 22: as shown in Fig. 8 of Matsuda et al, the tubular electrode 51a and 51d having a first plurality of orifices 58 each having a first conductance, and the tubular

electrode 51b and 51c having a second plurality of orifices 58 each having a second conductance, wherein the first conductance is equal to the second conductance.

Regarding claims 15-16, 21, 23: the distribution of the openings or orifices as well as the shape of the gas injector are considered obvious modification for distributing the gas preferentially over a section of the array of plasma in order to inject the reactant gas uniformly over the plasma gas. It was held in *re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)* that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

Claims 17 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knowles et al (US Patent No. 5,560,779) in view of Matsuda et al (US Patent No. 6,189,485 B1) as applied to claims 1-16, 18-23 and 25-31 above, and further in view of Maeda et al (US Patent No. 5,620,523).

Knowles et al in view of Matsuda et al teach all limitation of the claims as discussed above except for the reactant injector comprising an injector ring encompassing the array.

Maeda et al teach a plasma reactor including a ring-shaped reaction gas discharger 9a (Figs. 8A, 8B, 9A, 9B) arranged between a plasma forming chamber 1 and a wafer 20, wherein plasma flows through the center of the ring and the plasma does not react with the reactant gas on the surface of the ring and thus deposit is not formed on the ring which would peel off and fall on the wafer. (column 4, line 36 through column 5, line 17).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the ring-shaped reaction gas discharge design as taught by Maeda et al in

the apparatus of Hwang in order prevent forming deposit on the reactant gas injector which would peel off and fall on the substrate.

Response to Arguments

Applicant's arguments with respect to claims 1-31 have been considered but are moot in view of the new ground(s) of rejection.

The Applicant has amended the independent claims 1, 10 and 18 to specify the common reactant gas injector 220 being disposed in the deposition chamber 204 and between the electrodes (anodes) of the plasma 212 and substrate 230. The Applicant asserts the Hwang does not teach a common reactant gas injector disposed between the anode and substrate and thus rejection of these claims and claims dependent thereon under 35 USC 102(e) as being anticipated is overcome.

In response, the rejection of the claims under 35 USC 102(e) is withdrawn and instead a new ground of rejection of claims under 35 USC 103(a) is presented.

The Applicant further asserts that Knowles et al teach a single plasma generator 80 rather than at least one array of a plurality of plasma sources wherein each of the plasma sources includes a cathode and an anode.

The Examiner argues that the plasma generator 80 as taught by Knowles comprising a plurality of cathodes 88 and a common anode 82 forming a plurality of plasma sources arranged in two dimensions as shown in Figs. 6 and 7.

The Applicant further asserts that Matsuda et al teach a common reactant gas injector which is part of an electrode while the claimed common reactant gas injector does not form part of an electrode.

The Examiner argues that Matsuda et al has been utilized for teaching *common* gas manifolds 51e, 51f coupled to a plurality of gas distributors 51a-51d rather than as a gas injector electrode. The Examiner has argued that the it would have been obvious to implement the common gas manifolds as taught by Matsuda et al into the plurality of reactant gas injectors 100 of Knowles et al in order to distribute reactant gas uniformly over a substrate using a single reactant gas source.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Paquet (US Patent No. 5,985,378) teach a plasma reactor including a plurality of plasma sources arranged in a two dimensional array (Fig. 4).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (703)308-2050. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on (703)308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9310 for regular communications and (703)872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.

P. Hassanzadeh

Parviz Hassanzadeh
Examiner
Art Unit 1763

November 22, 2002